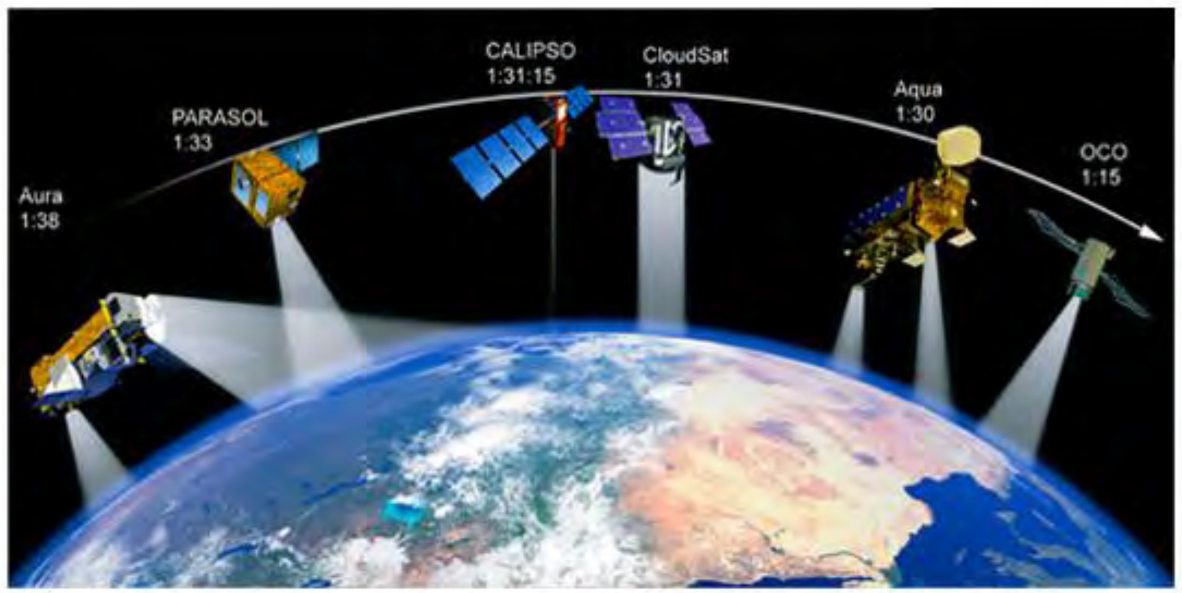
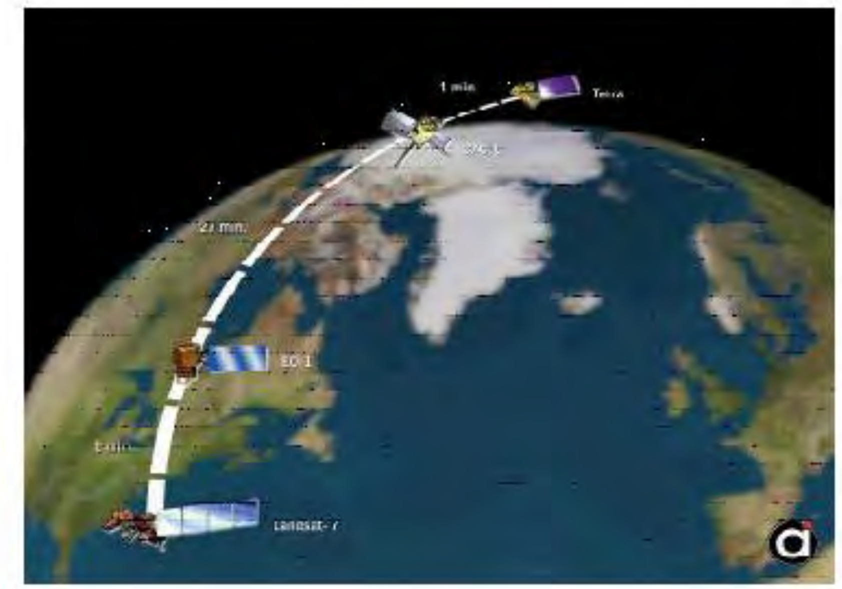
Jet Propulsion Laboratory
California Institute of Technology

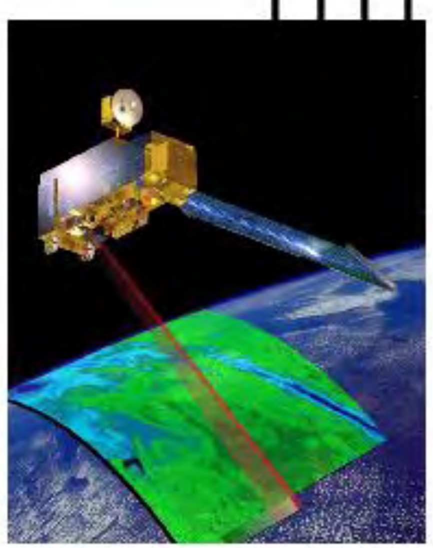
UNIVERSITY OF Redlands
MS GIS PROGRAM

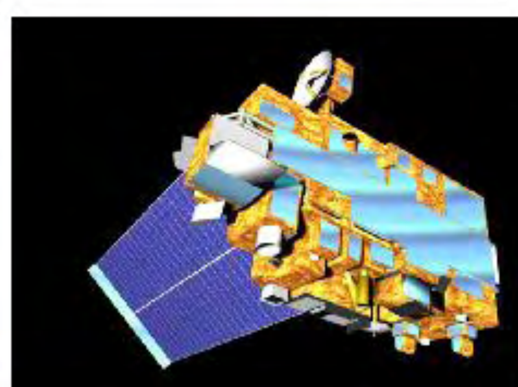
EOS - GIS

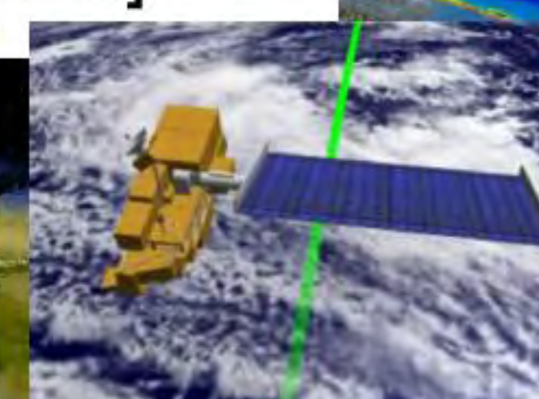


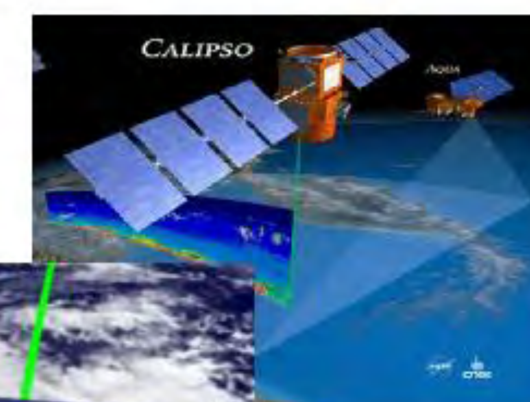


[[[[WRS - 2] A-Train] Aqua] AIRS/AMSU]
M-Train]LandSat - 7]
Terra] MODIS]









Consilience of Geographic Information Systems and Earth Sciences

Cartographers and earth scientists solve problems differently, even though their domains and representations have similarities. In both cases, there are spatial domains, visual representation, huge data and continual visual and computational analysis.

The cartographer's canvas is the earth's surface, naturally diverse in form, differentiated by man's uses, dominion and constructions. The diversity of resulting mixture of entities is daunting. However, while maps result from dynamic processes, they are not usually dynamic: although that is changing.

Earth science plays in a four dimensional arena containing spatially and temporally continuous phenomena. Historically, ways and means to acquire, analyze, transform, model, and visualize four dimensional data have been limited. New polar orbiting smart sounders like AIRS and AMSU-A acquire high resolution, 3-dimensional retrievals of water vapor, temperature and trace gases. This puts pressure on the rest of the process to deliver the data in useable form.

Satellites orbit relentlessly creating new instrument footprints and geophysical parameters, as the earth rotates. This creates a geometrical shape called "The Swath". The shape is geometrically straightforward. Just imagine wrapping a bowling ball with duct tape. However, it is new to cartographers because it is temporal:

Nonetheless, a swath can be projected, and footprints and parameters can be transformed into cells, points, bins, objects, volume features and curtains (read layers). These entities are familiar to cartographers. However, fully incorporating time is a big challenge.

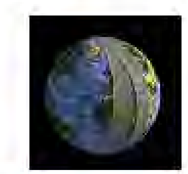
That’s where we are now. In a combined JPL/Redlands Institute/ESRI effort we use simulated visualization to probe ahead, but at the same time, prototype tools to enable basic interoperation between EOS data and ArcGIS: selecting AIRS/AMSU-A L2 granules and transforming them into point features and raster layers. We will move to modeling and visualization tools.

mpg

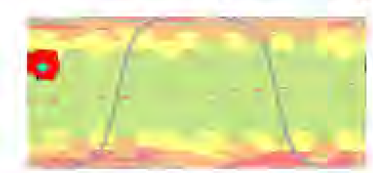
Swath Geometry
Geophysical Values
4D Geography

MODELLING AND VISUALIZATION

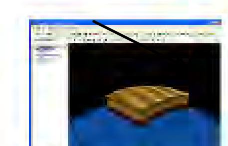
4D Geometric CGI



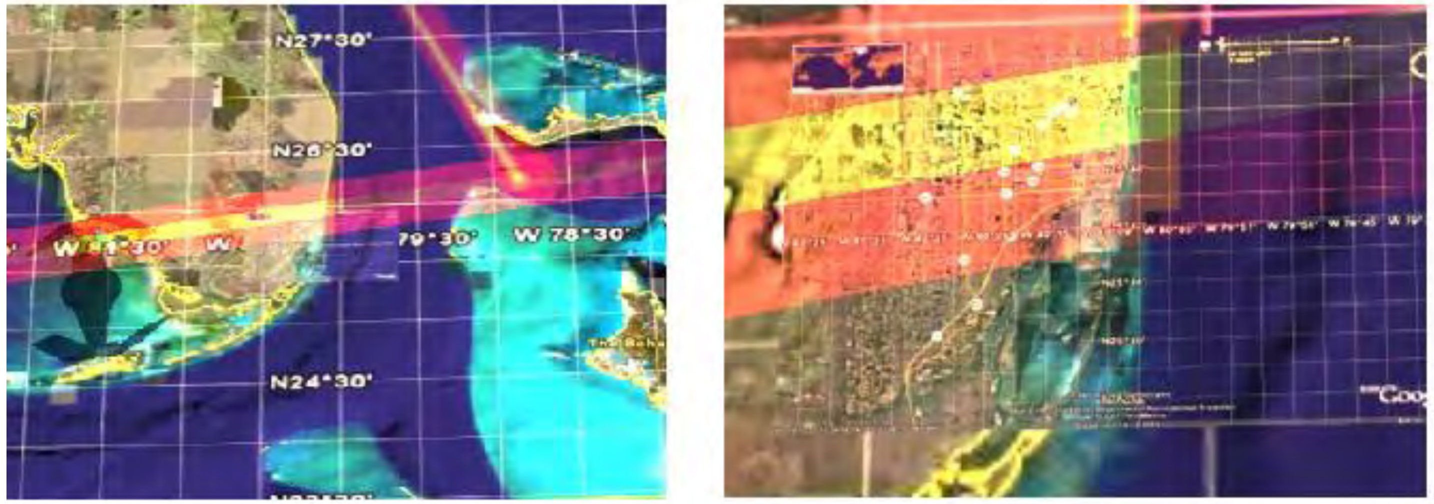
Agent Based



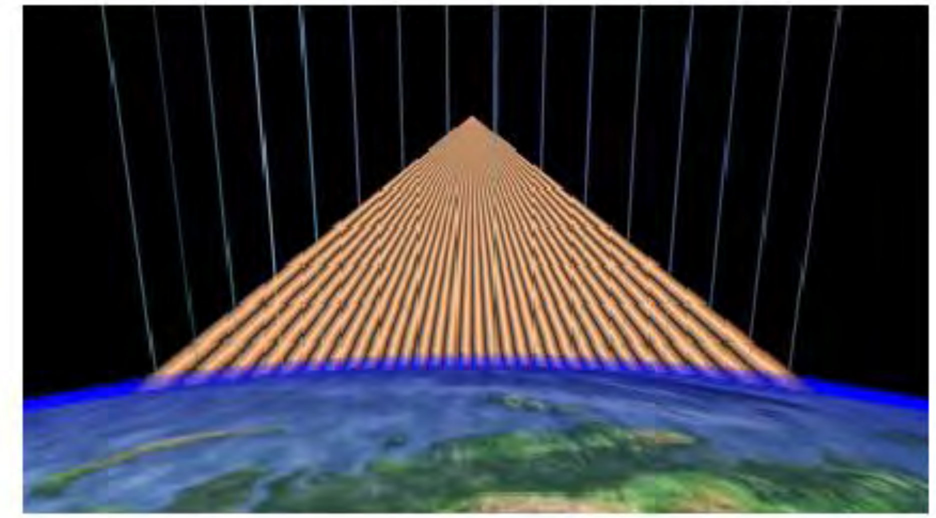
Data



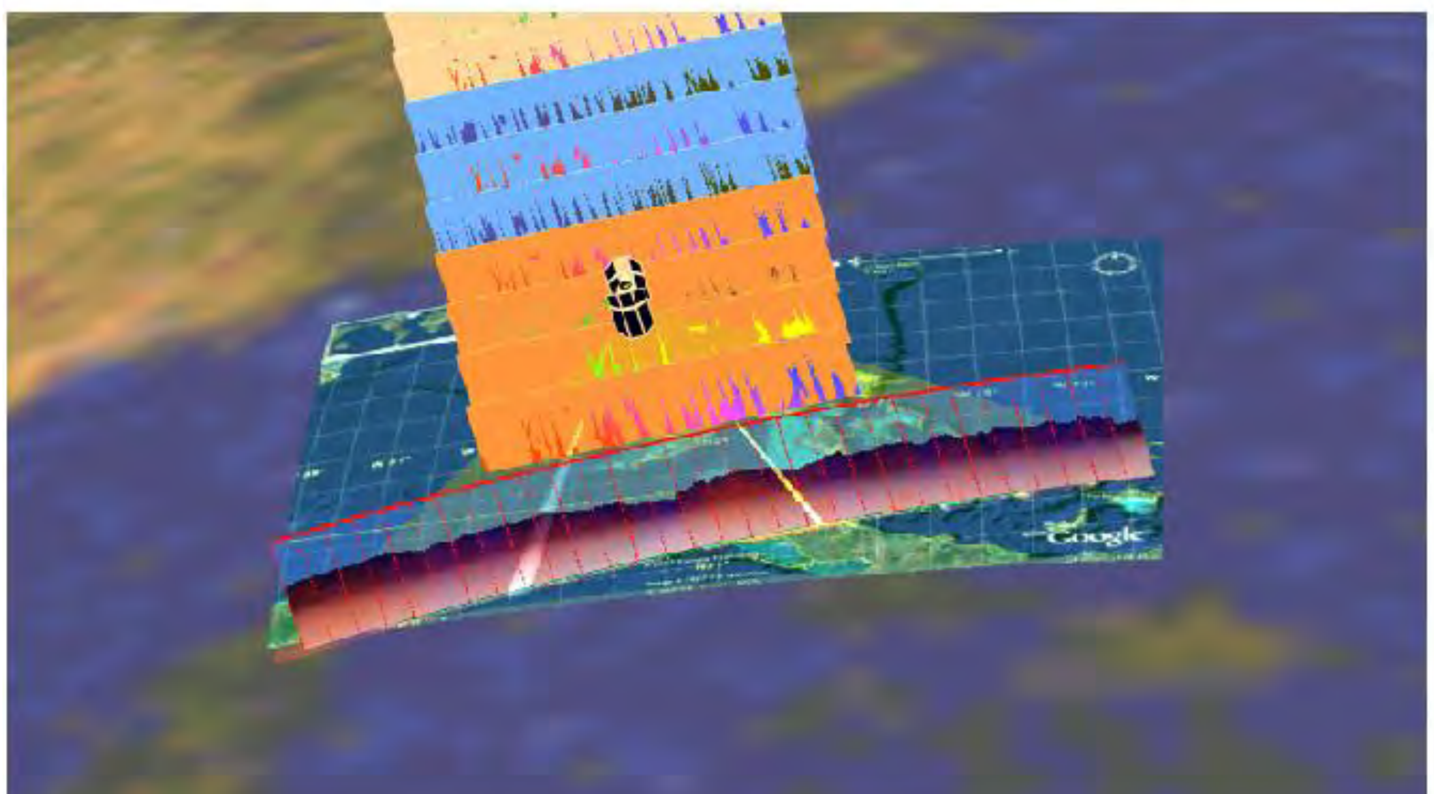
Light in Geometric Modelling and Visualization



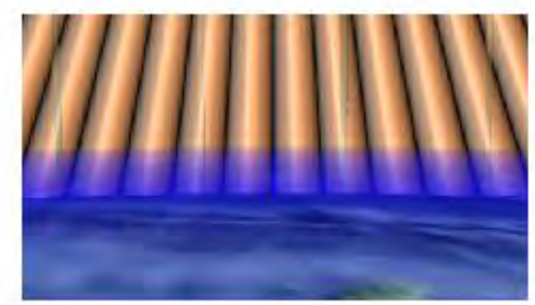
Combined Airs_AMSU Orbital Scan Geometry



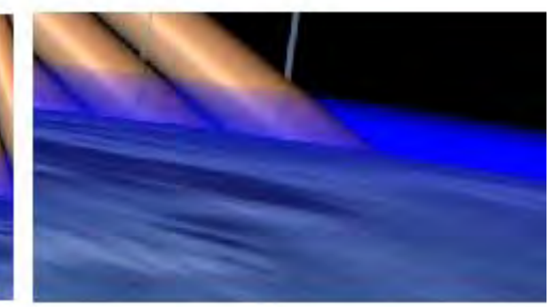
cross track



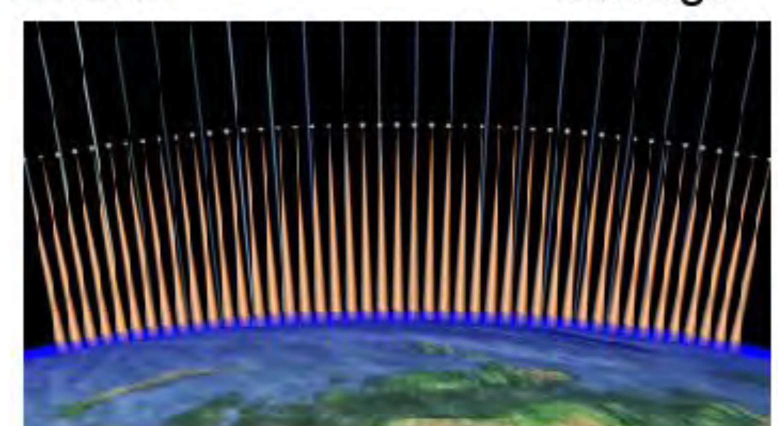
Platform Curtain Sensing Apparatus



at nadir

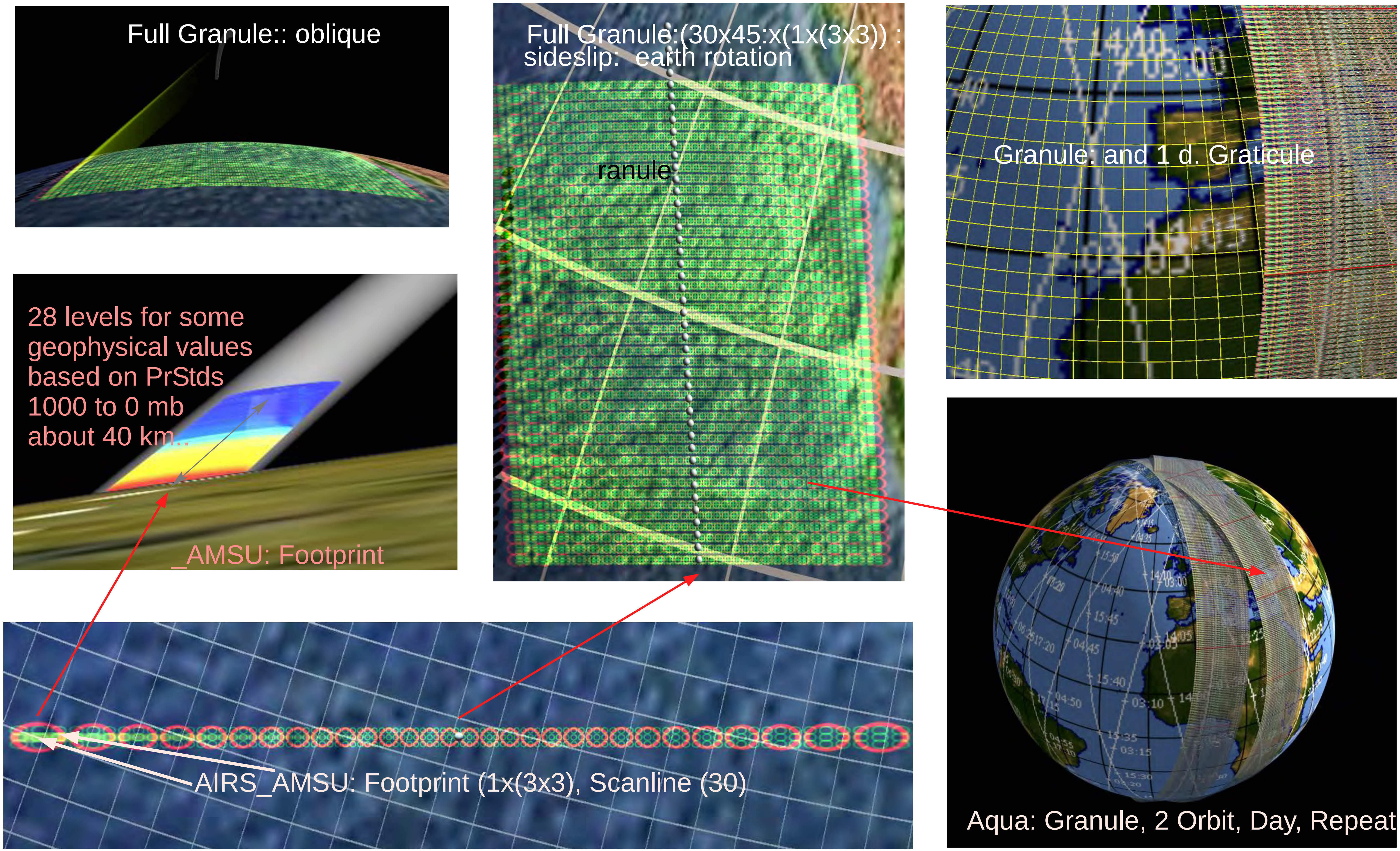


at edge

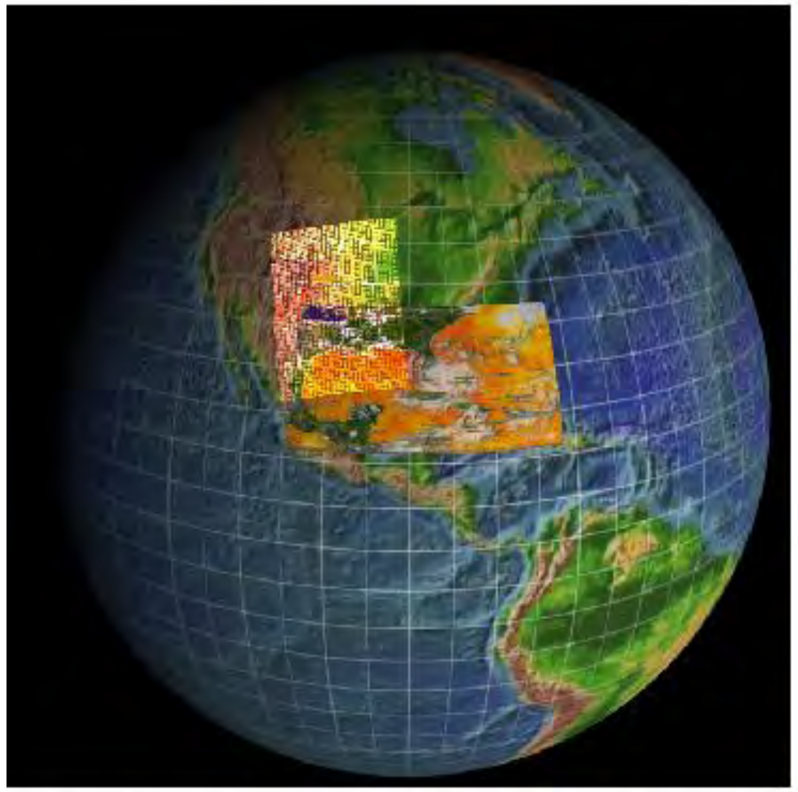


along track

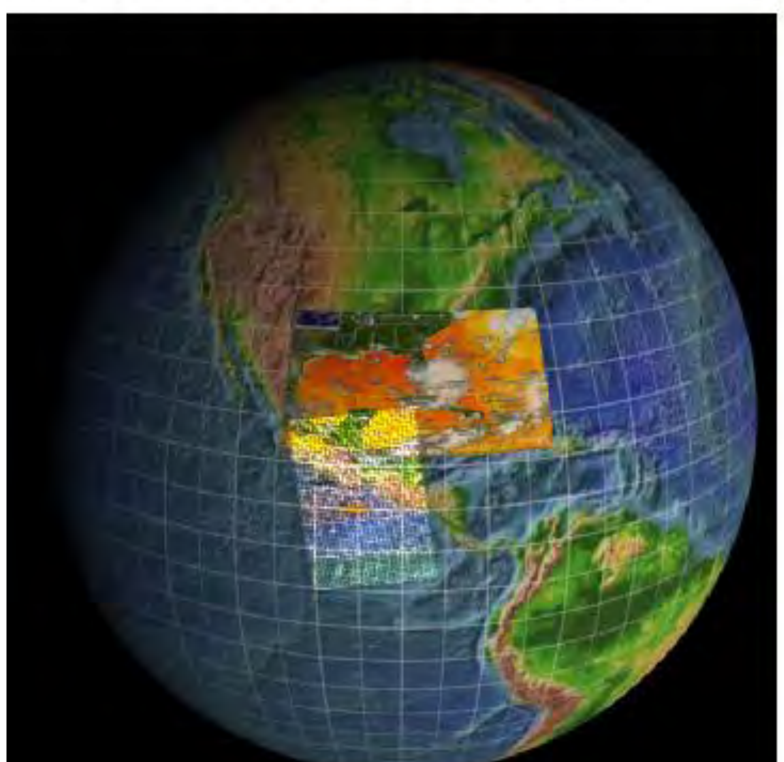
AIRS_AMSU Anatomy: Footprint, Scanline, Granule, Orbit, Day, Repeat Cycle

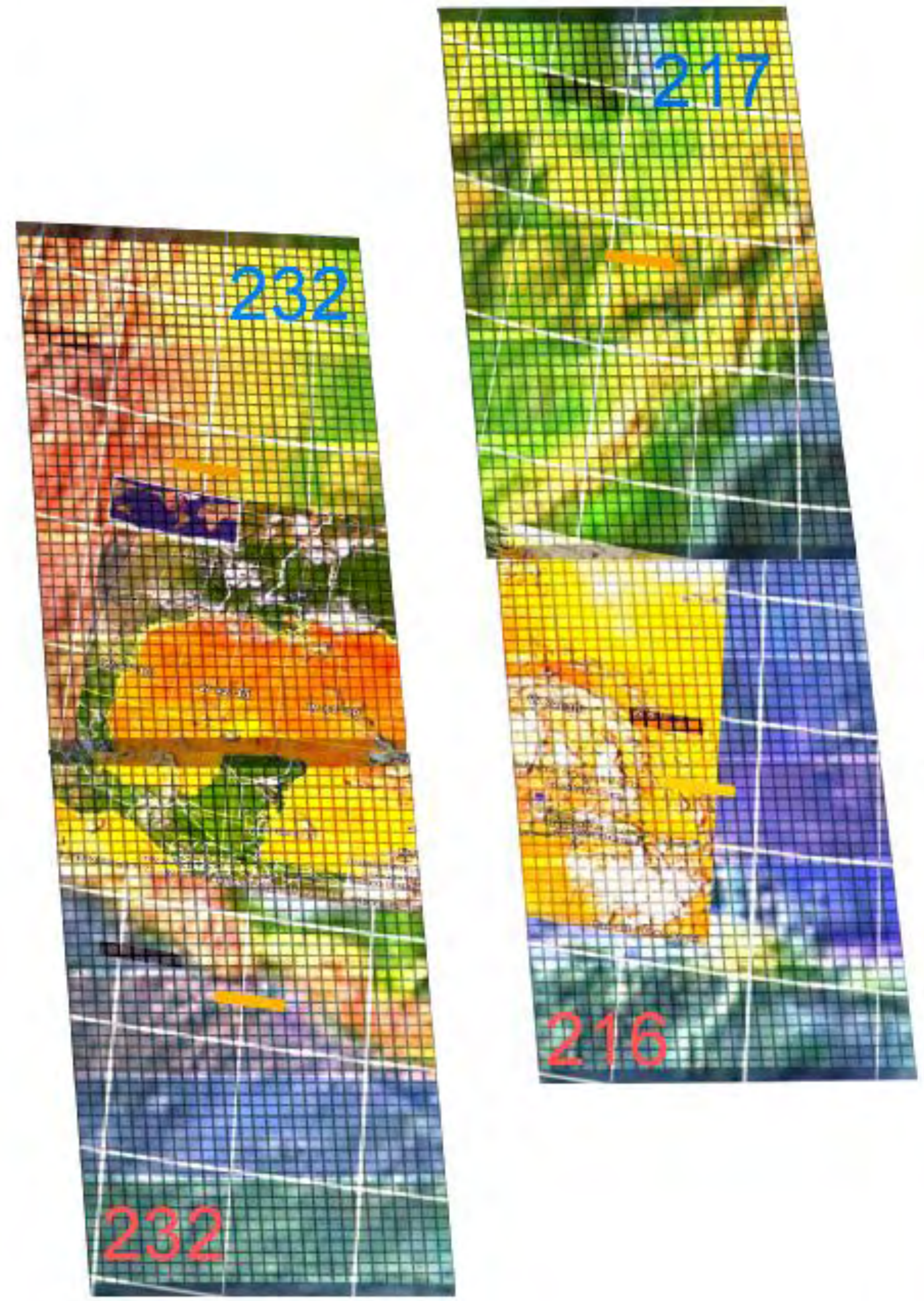


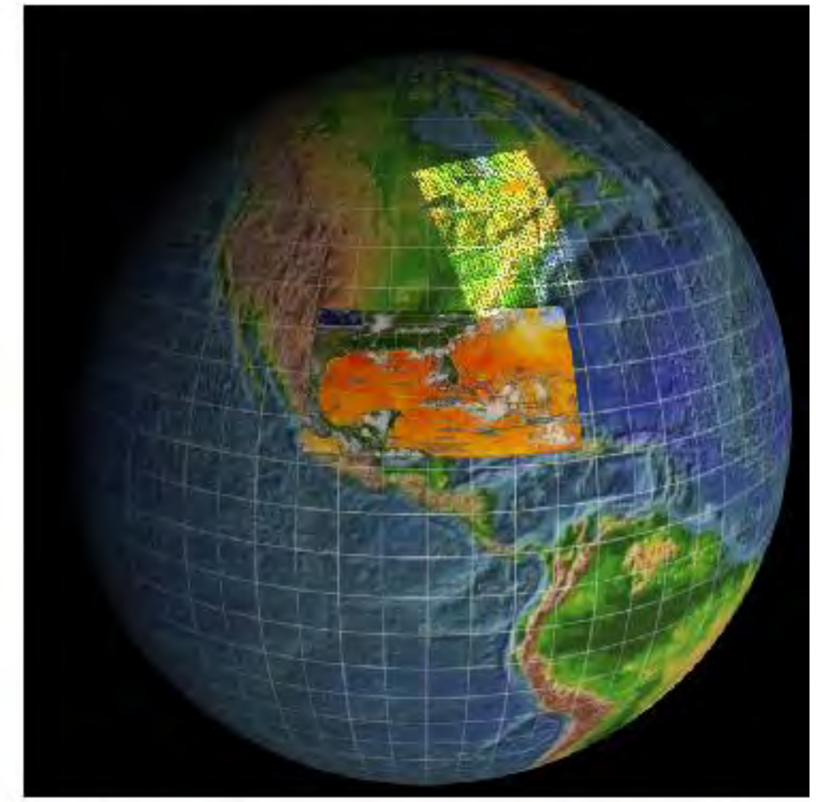
AIRS/AMSU Granule Positioning over an Domain of Interest



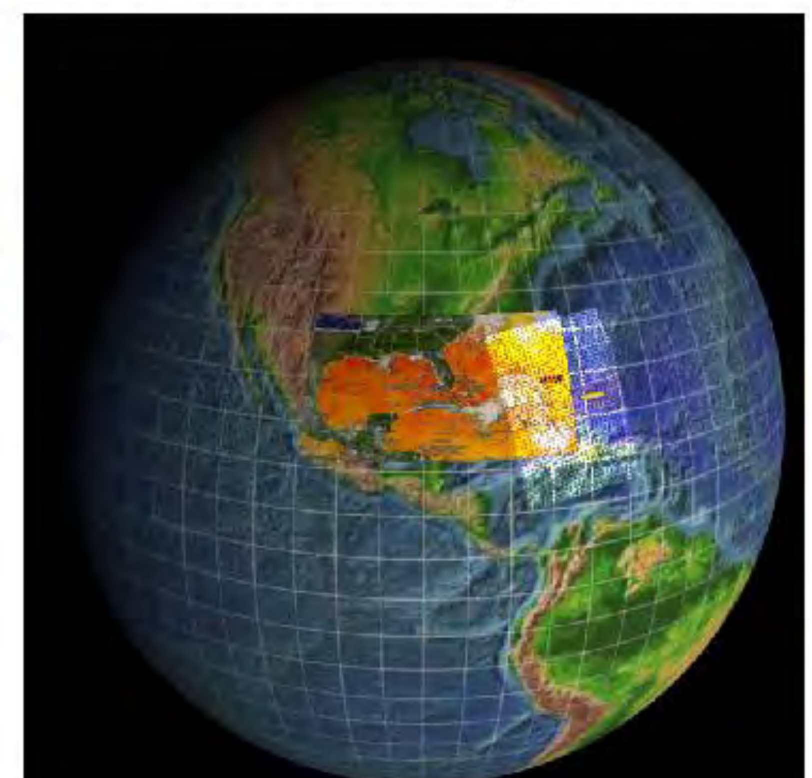
Orbit 118 Ascending: 15:10 - 16





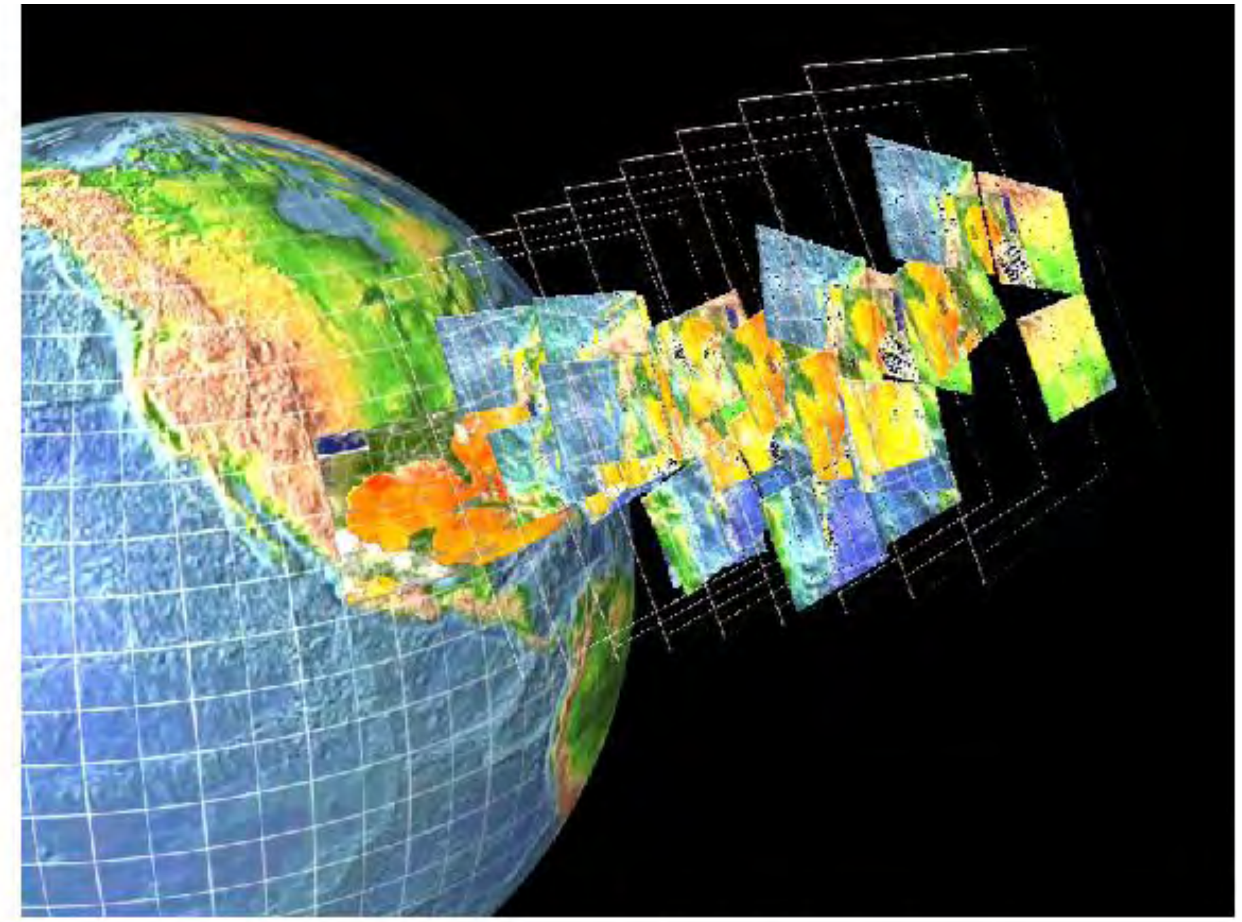


Orbit 117 Ascending: 13:36 -42

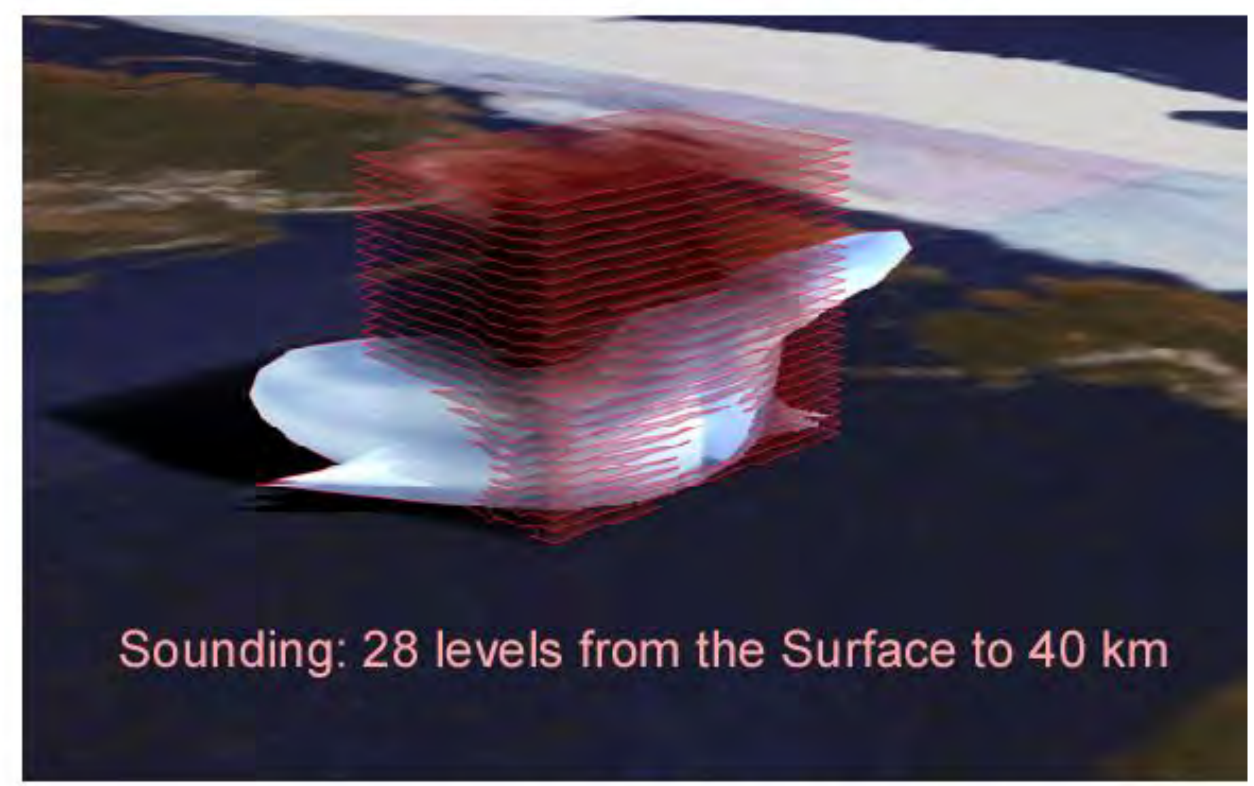


AIRS/AMSU: Adding Elevation and Time

Granules Acquired over Five Days

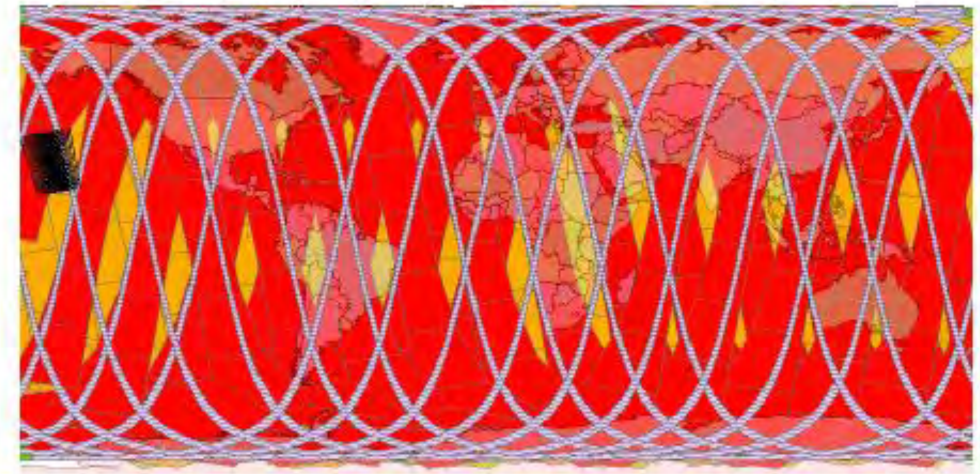


Time as the Third Dimension

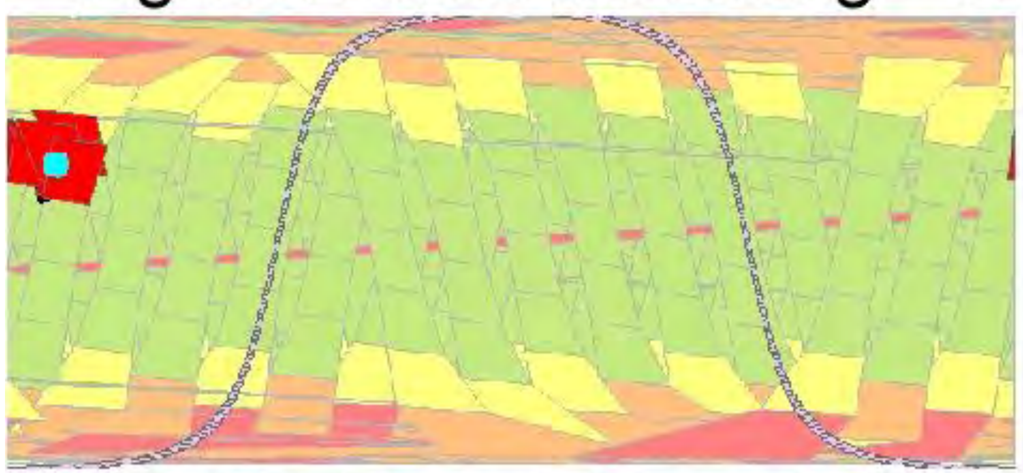


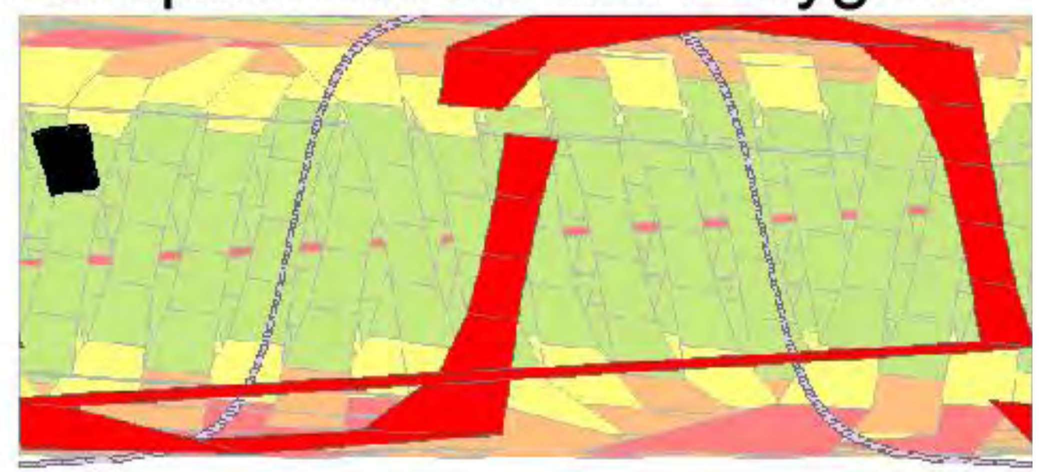
Pressure as the Third Dimension

Math Based Modelling - AQUA and LandSat - 7

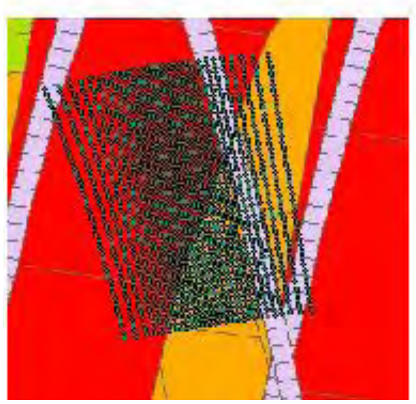


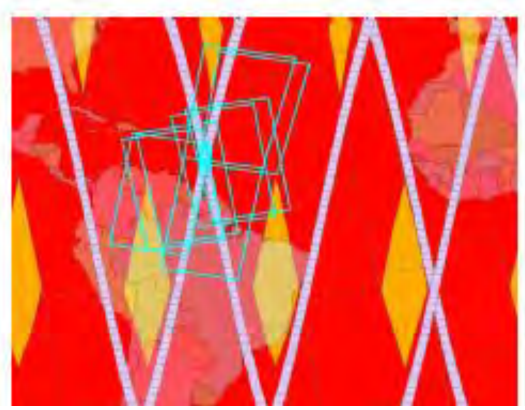
Agent Based Modelling - WRS - 2 Footprint to ArcGIS Polygon:

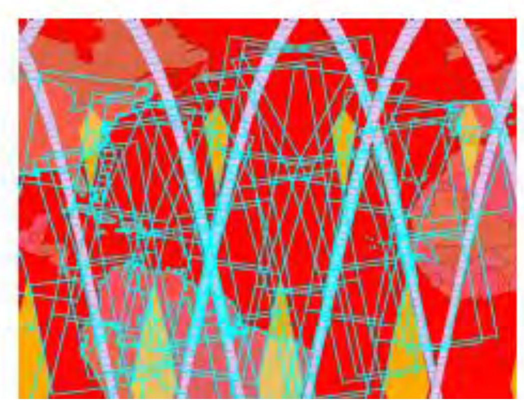




ArcGIS Based Granule/Scene Selection

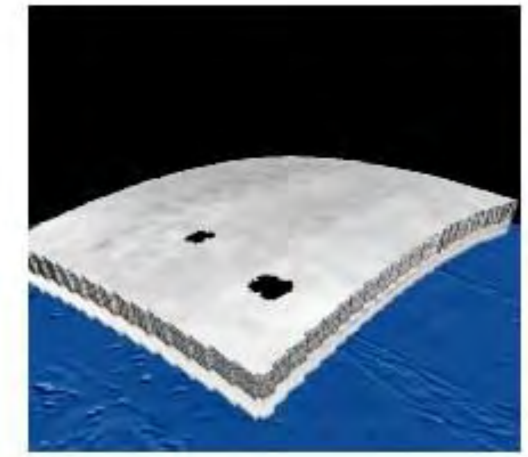






Data Model

AIRS/AMSU Sounding Values in ArcGIS



Polygons, Points and Rasters

Slice and Dice